Best-fit degree of ice particle surface roughness based on the reflection and polarization properties of clouds

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As an important shape parameter in the ice particle model, ice particle surface roughness substantially affects single scattering properties of ice particles and remote sensing retrievals [1,2]. Current operational satellite retrieval algorithms commonly assume that ice cloud pixels are horizontally homogeneous with a fixed degree of roughness. The degree of roughness that best represents scattering properties from remote sensing measurements needs to be understood.

In this work, ice particle models are tested against reflectance as a function of scattering angle from multi-directional measurements. The Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) is an airborne instrument to provide high-resolution multi-directional polarized reflectance measurements [3]. Various ice particle roughness models are applied to multi-directional total reflectance and polarized reflectance from AirMSPI to retrieve the best-fit degree of roughness. Moreover, to investigate the effect of considering polarization properties on retrievals, the best-fit roughness retrieved from polarized reflectance is compared with those from total reflectance.

References

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Preferred mode of presentation: Oral/Poster